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Ordering by the Numbers in Anatomy and by Letters Too

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Here, new rules of Latin anatomical nomenclature are proposed to deal with cases not covered by existing or other recommended rules. Determiners (e.g., numerals, letters, alphanumeric strings, and Latin names of Greek letters) should follow the noun they specify or limit, just as it is recommended that adjectives should follow the noun they modify. In general, Roman numerals, Latin letters, and Latin names of Greek letters are preferable to Arabic numerals and Greek letters in Latin anatomical terms. It is also noted that the word *typus* (type) appears to be superfluous and unnecessary in the Latin anatomical nomenclature.

Key words: anatomical nomenclature; anatomical terminology; Latin anatomical terms

The IFAA anatomical terminologies (FCAT, 1998; FICAT, 2008; FIPAT, 2013, 2017) use Latin and Greek letters, Roman and Arabic numerals, and alphanumeric combinations (short strings of characters) to indicate specific individual members of a set. These determiners, which specify or limit nouns, function like ordinal numbers, which are determiners as well as adjectives in linguistics. Roman numerals may be considered substitutes for ordinal numbers (see Table 1). Letters, whether they are used as part of an alphabetic sequence or as abbreviations of nouns and adjectives, can be treated as determiners (see Table 2).

Usage of alphanumeric determiners varies quite a bit in anatomical terminology because there are no rules that govern their use in anatomical terms. For example, Greek letters, or their Latin names, have appeared at the beginning or end of terms (e.g., *alpha granulum glycogeni*, *tubulinum beta*, *motoneuron* γ), and numerals are usually found at the end of terms. As part of the effort to simplify and clarify the meaning of Latin anatomical terms, the following guidelines for the use of letters, numerals, and alphanumeric combinations are recommended:

1. Alphanumeric determiners and names of Greek letters should follow the noun they limit or specify.
2. Roman numerals and Latin letters are generally preferred in Latin terms.

In some cases, especially in alphanumeric combinations, there may be traditional use of Latin or Greek letters, and of Roman or Arabic numerals. Arabic numerals are acceptable, especially in alphanumeric strings where Roman numerals may be confused with Latin letters and in cases where the entity is commonly associated in the literature with Arabic rather than Roman numerals (see Table 3). A space between Latin letters and Roman numerals may help distinguish them. Superscripts and subscripts should be avoided because they are not supported by ASCII codes (ASA, 1963).

Terms usually associated with Greek letters (α, β, γ, etc.) should use the Latin names of these Greek letters (*alpha*, *beta*, *gamma*, etc.) (see Table 4).

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TABLE 1. Examples of Terms Containing Roman Numerals

Lamina I isocorticis
Digitus II pedis
Regio III cornus ammonis
Vertebra cervicalis IV
Os V metacarpi
Costa VI
Segmentum VII hepatis
Bronchus VIII pulmonis sinistri
Lamina spinalis IX
Lobulus X hemisphaerii cerebelli
Nervus cranialis XI
Nervus thoracicus XII

Exclusive use of the Latin alphabet simplifies anatomical terms and makes them more compatible with computer applications because Greek letters are not included in the seven-bit ASCII code table, and only a few Greek letters are represented among the "extended ASCII characters" (eight-bit codes) of ISO/IEC 8859–1 (ISO/IEC JTC1, 1998). The names of Greek letters are indeclinable neuter nouns, so there are no plural or genitive forms. Although use of the name of the Greek letter with a Latin noun is technically an apposition (Neumann, 2017), the name of the Greek letter is a substitution of convenience for the Greek letter so it can be treated in anatomical terminology simply as a determiner.

The word *typus* (type) has occasionally been used in IFAA terminologies (e.g., *pneumocytus typus I*, *fibra collageni typi III*, *typus ampullaris pelvis renalis*). In fact, use of the word *typus* can be described as sporadic and irregular. The word is probably superfluous or unnecessary in most, if not all, anatomical terms in which it appears. *Pneumocytus I*, *fibra collageni III*, and *pelvis renalis ampullaris* are shorter, simpler, and sufficient (see Table 5). Although punctuation and other special characters should be avoided in anatomical terms, dashes are useful in plural terms in which a range of values is specified (e.g., epitheliocyti reticulares I-III, laminae spinales III-IV).

TABLE 2. Examples of Terms Containing Latin Letters

Anaphasis A
Spermatogonium B
Thyrocytus C
Facies E
Stria H
Crus p
Endocrinocytus PYY
Lymphocytus T
Chromosoma X
Linea Z

TABLE 3. Examples of Terms Containing Alphanumeric Combinations

Neuron retinale A8
Vertebra C4
Regio CA3
Neuromerus D2
Phasis G1
Nervus spinalis T12
Lamina 6b isocorticis
Endocrinocytus delta 1
Lobulus H X cerebelli

TABLE 4. Examples of Terms Containing Names of Greek Letters

Pars alpha nuclei gigantocellularis
Actininum alpha
Internexinum alpha
Filamentum internexini alpha
Tubulinum beta
Endocrinocytus beta
Motoneuron gamma
Granulum gamma glycogeni
Granulum delta thromobocyti
Locus lambda

TABLE 5. Examples of Terms that Could Be Simplified By Removing the Word *typus*

Current term	Recommended term
Cellula T adjuvans typi II	Cellula T adjuvans II
Epitheliocytus intercalatus typus A	Epitheliocytus intercalatus A
Epitheliocytus reticularis typorum I-III	Epitheliocyti reticulares I-III
Fibra collageni typi III	Fibra collageni III
Pneumocytus typus I	Pneumocytus I
Typus ampullaris pelvis renalis	Pelvis renalis ampullaris

Although punctuation and other special characters should be avoided in anatomical terms, dashes are useful in plural terms in which a range of values is specified (e.g., epitheliocyti reticulares I-III, laminae spinales III-IV).

As with the established and proposed rules for Latin anatomical nomenclatures (Neumann et al., 2017), the guidelines suggested here are intended for Latin terms not for equivalents in other languages. For example, in many modern languages, Arabic numbers will be preferable to Roman numerals in anatomical terms.

Errata: In response to earlier publications in this series (Neumann, 2017; Neumann et al., 2017), W. A. C. van de Riet (The Netherlands) noted that *os ischium* does not actually appear in Terminologia Anatomica (FCAT, 1998), and that *musculus psoas major* is not necessarily an apposition. Although *psoas* is usually interpreted by anatomists to be a nominative singular masculine noun (Faller, 1978), or a transliteration of a variant (archaic or Ionic) Greek nominative plural feminine noun (Liddell et al., 1996), it can also be considered a transliteration of a Greek genitive singular feminine noun (Hyrtl, 1880). Thus, *musculus major psoae* is an alternative to the Regular Anatomy (RA) term *psoas major*.

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